



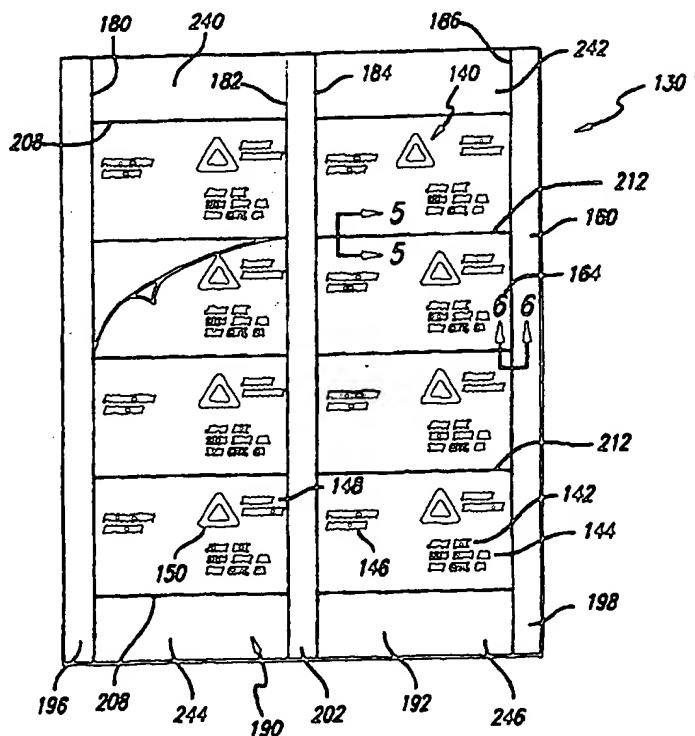
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: **SYSTEM OF FORMING A SHEET OF EASILY AND CLEANLY SEPARABLE PRINTABLE MEDIA**

## (57) Abstract

Two pairs (180, 182, 184, 186) of parallel substantial-cut or scored lines extend the length of a card stock sheet (160) and short through-cut lines (208, 212) extend between each of the pairs to define two columns (190, 192) of business card blanks (164) on the sheet (160). The sheet (160) is passed through a laser or ink jet printer or copier, printing the desired identifying or other indicia (140) on the blanks (164). The blanks (164) are then separated along the substantial-cut (180, 182, 184, 186) and through-cut lines (208, 212) and the waste sheet portions (196, 198) at the ends, sides, and between the columns are disposed of. The business cards (164) separate cleanly along the substantial-cut lines, superior to the microperforated business card separation lines. Even with the substantial-cut and full-cut lines, the card stock sheets have enough integrity to reliably pass through the printer without breaking apart. To make for a cleaner break along the substantial-cut lines, the substantial-cut lines can be made by scoring part way into the sheet on both opposing sheet faces. Also, cleaner break lines can be provided by first subjecting the sheet to a process, such as supercalendering, which makes the sheet more brittle and/or densifies the paper fibers.



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**SYSTEM OF FORMING A SHEET OF EASILY AND CLEANLY SEPARABLE  
PRINTABLE MEDIA**

**Background of the Invention**

The present invention relates to methods of forming  
5 business cards and to the constructions of sheets of blank-  
business cards for passing through laser or ink jet  
printers or copiers.

A sheet of business cards as known in the prior art  
is shown in FIG. 1 generally at 100. Sheet 100 is a  
10 drawing of the sheet after having passed through a laser  
or ink jet printer and with the desired indicia 104  
printed thereon. Sheet 100 was formed with a gridwork of  
horizontal and vertical microperforation lines 108, 110  
extending the full length and width of the sheet. The  
15 microperforations are typically more than fifty per inch.

Although the microperforations are thereby small and  
close together, when the cards 112, after the printing  
operation thereon, are separated from one another by  
tearing along the lines, perfectly clean cuts or edges do  
20 not result. Rather, the edges 114 are slightly fuzzy as  
shown in the enlarged view of FIG. 2. These fuzzy edges  
114 give the card 112 a less professional look than clean  
knife cut edges and in certain uses are unacceptable.  
Currently, business cards have substantially clean edges  
25 as they are manufactured by Quick printers (such as KINKOS  
or PIP). However, the laser and ink jet card products  
including laser and ink jet card products do not provide  
clean edges, similar to the main stream business cards.

- 2 -

Summary of the Invention

Directed to remedying problems in the prior art, disclosed herein is an improved business card sheet assembly. The assembly includes, according to one preferred embodiment, a card stock sheet having two parallel pairs of substantial-cut lines extending the length of the sheet and engaging the sheet at both ends thereof. Instead of paper sheets, rolls, fan fold or other print media can be used. The substantial-cut lines extend about 90% through the thickness of the sheet from the front towards the back surface. The sheet is then die cut with short (through-cut) lines extending widthwise between the lines of each pair, or vice versa. The substantial-cut and through-cut lines form on the sheet two columns of business card blanks, with paper waste strips at the side (and end) margins and between the columns. The sheet is then passed through desk top printers, such as laser or ink jet printers or copiers, and the desired indicia is printed on each of the blanks. The printed card blanks are then separated from one another along the substantial-cut and through-cut lines. The borders or edges of the resulting cards are cleaner, superior to the prior art microperforated cards.

To provide for an even cleaner card edge where it was separated along the substantial-cut lines, the substantial-cut lines can be formed by scoring the sheet part way on both faces of the sheet. Thereby, the intact portion of the sheet along these lines will be at the

-3-

middle (approximately ten or twenty percent) thickness of the sheet. After separation, the torn fibers, being in the middle of the sheet, will be less visible. Also, this construction allows for greater manufacturing control of the formation of the substantial-cut lines to accommodate for different thickness of the paper, depending on where it is taken from the paper roll.

Additionally, a cleaner card edge can be provided by first making the paper more brittle, by densifying its fibers. Preferably, this is done by supercalendering the paper. Supercalendering is a process that has been used by paper manufacturers for many years to produce relatively denser and thinner paper. Instead of supercalendering, the paper can be done by subjecting the paper to chemical or radiation treatments, or other ways as would be apparent to those skilled in the art from this disclosure.

Other objects and advantages of the present invention will become more apparent to those persons having ordinary skill in the art to which the present invention pertains from the foregoing description taken in conjunction with the accompanying drawings.

#### Brief Description of the Drawings

FIG. 1 is a front view of a sheet of business cards of the prior art, after having been printed, and showing one of them being torn away along its microperforation lines;

-4-

FIG. 2 is an enlarged view taken on circle 2 of FIG. 1;

FIG. 3 is a perspective view showing sheet assemblies of the present invention passing through a printer;

5        FIG. 4 is a front elevational view of one of the sheet assemblies of the present invention after a printing operation has been performed thereon;

FIG. 5 is an enlarged view taken on line 5-5 of FIG. 4;

10       FIG. 6 is an enlarged view taken on line 6-6 of FIG. 4;

FIG. 7 is a view similar to FIG. 6 showing an alternative embodiment of the present invention; and

15       FIG. 8 is a front elevational view of an alternative sheet assembly before a printing operation.

#### Detailed Description of Preferred Embodiments of the Invention

Referring to FIGS. 3-6, a sheet assembly of the present invention is shown generally at 130. The sheet assembly 130 is shown at the bottom left of FIG. 3 before entering the printer 134 and as it would be purchased by the user (after removal from its packaging (not shown)). The sheet assembly 130' is shown in the upper right of FIG. 3 and (in isolation) in FIG. 4 after having passed through the printer 134, and with the identifying indicia shown generally at 140 printed thereon. As an example, the indicia 140 can include the individual's name 142, address 144, title 146, company name 148 and company logo

-5-

150. It can additionally or alternatively include other information such as telephone and facsimile numbers and/or E-mail addresses as desired. The printer 134 can be a laser or ink jet printer, or photocopier.

5       The sheet assembly includes a sheet of paper 160 such as ten mil thick cardstock available from Simpson Paper Mill in Pomona, California. The thickness of the sheet of paper 160 is preferably between seven and twenty mils. A pattern of sheet portions or cards 164 is defined on the  
10 sheet by a pattern of lines. The sheet portions 164 are preferably rectangular, but other shapes are within the scope of the invention. For example, the sheet 160 can have dimensions of 8 1/2 x 11 inches and each of the portions 164 can have the dimensions of a traditional  
15 business card (e.g., two by three and a half inches).

Alternatively, the sheet 160 can be supercalendered paper material. It can have a thickness of between one mil to ten mil plus, and preferably between six and thirteen mil. The reason for this somewhat broad  
20 thickness range is that some printers, such as ink jet printers, cannot handle heavier or thicker material so that card stock of six, seven or eight mils is needed. On the other hand, other copiers and printers, such as laser printers, can handle thicker materials. The  
25 supercalendaring process compresses the paper so that its thickness is reduced by between two and forty percent, for example.

The weight of the paper sheet can be between sixty and one hundred and fifty pounds. While the lower end of

-6-

that range may be a little too low, the upper end is probably more realistic. One hundred and fifty pound non-calendared paper is typically thirteen to fifteen mil thick and thereby generally too thick to pass through today's printers. However, that same weight paper when supercalendered has a reduced thickness of eleven to thirteen mil, which is thin enough to pass through most printers.

Supercalendering is a process that crushes or compresses the fibers of the sheet, thereby densifying the sheet. Because the sheet is densified, its fibers break or crumble easier along the desired lines. This provides for cleaner edge lines for the business cards.

Although supercalendering is a preferred method of making the paper fibers brittle, other processes are within the scope of this invention. One example is to apply radiation, such as ultraviolet or gamma energy, to the sheet. This can be over the entire sheet evenly or more focused along the desired separation lines. Another process is to apply a chemical to the sheet, such as a dilute acid coating. Again, this can be an even coating on the paper or a more focused application along the desired separation lines. It can be applied before, after or during the formation of the separation lines. For example, if the separation lines are formed by scoring, the chemical may be deposited by application physically on the scoring knives or tools. Separation lines or the entire sheet can be created with stiffening and weakening materials, such as polymers. For example, the sheet can



-7-

be coated with a very hard polymer, making the entire sheet more brittle, or just the separation lines coated with this brittle polymer.

At least one of the defining lines is a "substantial-cut" line 170, cut along its entire length, substantially  
5 but not all of the way through the paper 160; that is, cut from the top surface 174 of the paper approximately ninety percent the way through towards the bottom surface 178. This is shown in enlarged view in FIG. 6. A preferred  
10 embodiment has the substantial-cut line(s) 170 extending 9.3 to 9.5 mil through a ten mil thick cardstock. Alternatively, they can extend between seventy and ninety-eight percent of the distance therethrough. The substantial-cut lines 170 can be formed by trimming wheels  
15 (rotary knives), by die cutting, laser scoring, or chemical or acid etching.

A preferred pattern of defining lines is best shown in FIG. 4. It includes four parallel lengthwise lines 180, 182, 184, 186 extending the length of the sheet 160  
20 and defining two parallel columns 190, 192 with waste strips 196, 198 at the outer edges and one center waste strip 202 between the columns. Spaced parallel widthwise lines 208, 212 extend the widths of the columns 190, 192, but not beyond them. As can be understood from FIG. 4,  
25 the lengthwise lines 180, 182, 184, 186 define the left and right edges of the sheet portions or cards 164 and the widthwise lines 208, 212 extend from the top and bottom edges thereof.

-8-

The lengthwise lines 180, 182, 184, 186 are each substantial-cut lines 170 as disclosed above. And the widthwise lines 208, 212 are preferably each through-cut lines, as best shown in FIG. 5 at 220, extending the entire distance through the sheet 160 along their entire lengths; that is, they are between and engage adjacent of the lengthwise lines. The through-cut lines 220 define a perfectly smooth edge and thus are preferred over microperforated or substantial-cut widthwise lines. They also do not require any separating effort. Preferably, none of the through-cut lines 220 engages any edge of the sheet 160. If they did, the sheet 160 would be likely to be torn prematurely along the line. However, the pattern of substantial-cut and full-cut lines still provides the card stock sheet 160 with sufficient integrity to reliably pass through the printer without breaking apart.

After the sheet assembly 130 has passed through the printer 134 and the desired indicia 140 printed thereon, the individual cards (or printed media) 164 are separated by tearing or pulling along the four substantial-cut lines. Of course, no further separation is required on the through-cut lines. The side and center waste strips 196, 198, 202 can then be disposed of, as can the end margin strips 240, 244 at the ends of both of the columns.

As described above, relative to FIG. 6, the substantial-cut lines can be formed through one side (or face) of the paper 160. An alternative embodiment forms the substantial-cut line by "cutting" (or penetrating) the sheet from both sides, as shown in FIG. 7, by top cut or

-9-

penetration 250 and bottom cut or penetration 254, leaving a thin center piece 258. These two penetration lines 250, 254 can be formed by trimming wheels (rotary knives), by die cutting, laser scoring, or chemical or acid etching.

5 Preferably, they are formed with a scoring process.

If the paper 160 is a ten mil sheet, the top and bottom scorings 250, 254 can each be two mil, leaving about sixty percent of the fibers intact in the center 258. Alternatively, the scorings can even be 4.75 mil  
10 from both sides, leaving the center 258 only one-half mil thick (or any distance in between). The sheet 160 with this thin center 258 will have enough integrity not to fall apart depending on the kind of paper used and the configuration of the printer path. If the path is very  
15 convoluted, the one-half mil may not be enough, but for (printers with) straight paths it will likely be sufficient. Half mil thickness may also be sufficient where the paper 160 has long fibers, or where the paper has not been supercalendered or otherwise made brittle as  
20 discussed above.

Scoring on both sides tends to give the card (or printed media) when separated from the rest of the sheet a cleaner edge. One reason for this is that the separated fibers are in the middle of the sheet, not hanging out  
25 from either the top or bottom. When they are in the middle of the sheet 160 (that is, the middle of the thickness of the paper), they are likely to be less visible to the human eye.

- 10 -

Also, scoring on both sides provides another level of control in the manufacturing process of this assembly. Paper 160 will vary in thickness depending upon whether it is sliced from one end of the paper roll, the middle or the other end. When scoring on two sides, as depicted in FIG. 7, there is a better opportunity to adjust to variations in paper thickness, because two controls are thereby available.

A preferred technique is to score the top and bottom cuts 250, 254 simultaneously. However, it is also within the scope of the present invention to make the top and bottom scores at different times. This scoring can be by mechanical means, such as knives, by chemical means or by laser means. Additionally, these score lines can be oriented either horizontally or vertically relative to the direction in which the scoring machine is running.

Another sheet embodiment is shown in FIG. 8 at 270 having four lengthwise scored (not through-cut) lines 274, 278, 282, 286. Then the widthwise lines will have two through-cut lines 290, 294, not extending across the side margins 298, 302 or the center gutter 306.

An alternative arrangement provides short perforated lines 310, 314, 318 across both side margins 298, 302 and the center gutter 306. Although these short perforated lines provide for easier user access to the (ten) business cards 322 in the two columns, they also make the manufacture of the sheet 270 more difficult and thus may be eliminated if desired. Thus, the perfectly clean through-cut edges are provided on the top and bottom of

- 11 -

each of the cards, and the left and right ends are defined by the scored lines. Alternatively the positioning of the score lines and through-cut lines can be reversed, if desired.

5        From the foregoing detailed description, it will be evident that there are a number of changes, adaptations and modifications of the present invention which come within the province of those skilled in the art. However, it is intended that all such variations not departing from  
10 the spirit of the invention be considered as within the scope thereof as limited solely by the claims appended hereto.

What is Claimed is:

1. An assembly for passing through a printer or copier and separating out into individual printed cards, comprising:

print media;

first and second substantial-cut lines extending substantially the thickness of said print media and extending the length or width of said print media;

parallel and spaced weakened separation lines extending perpendicular to and between said substantial-cut lines on said print media;

wherein said separation lines and said substantial-cut lines define a column or row of card blanks; and

wherein said print media is adapted to be passed through a printer or copier and desired indicia printed on said card blanks, which can then be separated from one another along said separation lines and said substantial-cut lines.

2. The assembly of claim 1 wherein said print media is a sheet, a roll or a fan fold.

3. The assembly of claim 1 wherein said print media is a sheet of paper.

4. The assembly of claim 3 wherein said sheet of paper bonded or laminated with another paper, film or foil.

- 13 -

5. The assembly of claim 3 wherein said sheet has been subjected to a process making said sheet more brittle.

6. The assembly of claim 5 wherein the process is a supercalendering process.

7. The assembly of claim 5 wherein the process is a chemical process.

8. The assembly of claim 5 wherein the process is an irradiation process.

9. The assembly of claim 8 wherein the irradiation process uses ultraviolet radiation.

10. The assembly of claim 8 wherein the irradiation process uses gamma radiation.

11. The assembly of claim 5 wherein the process is applied before said substantial-cut lines are formed.

12. The assembly of claim 5 wherein the process is applied after said substantial-cut lines are formed.

13. The assembly of claim 5 wherein the process is applied simultaneously with the formation of said substantial-cut lines.

- 14 -

14. The assembly of claim 1 wherein at least one of said first and second substantial-cut lines is formed by penetrating through said print media through both first and second faces thereof by first and second penetrations.

15. The assembly of claim 14 wherein said first and second penetrations together penetrate through between 40 and 95 percent of the thickness of said print media.

16. The assembly of claim 14 wherein said first and second penetrations together penetrate through generally 80 percent of the thickness of said print media.

17. The assembly of claim 14 wherein said first and second penetrations are both made by scoring.

18. The assembly of claim 14 wherein said first and second penetrations are made simultaneously.

19. The assembly of claim 14 wherein said second penetration is made after said first penetration.

20. The assembly of claim 1 wherein said print media is a sheet.

21. The assembly of claim 20 wherein said first and second substantial-cut lines are spaced parallel to one another.



22. The assembly of claim 21 wherein said substantial-cut lines extend the length of said sheet, and said separation lines and said substantial-cut lines define a column of card blanks.

23. The assembly of claim 22 wherein said separation lines comprise through-cut lines cut all of the way through said sheet and extending between and engaging at opposite ends thereof said first and second substantial-cut lines.

24. The assembly of claim 23 wherein end portions of said column of business card blanks engaging ends of said sheet define waste strips.

25. The assembly of claim 23 wherein said column of business card blanks defines a first column of business card blanks, and further comprising third and fourth substantial-cut lines in said sheet and additional separation lines extending therebetween and defining a second column of business card blanks, parallel to said first column.

26. The assembly of claim 25 further comprising a waste paper strip between said first and second columns and defined on opposite sides by said second and third substantial-cut lines.

- 16 -

27. The assembly of claim 22 wherein said sheet is 10 mil thick cardstock.

28. The assembly of claim 27 wherein said substantial-cut lines are cut approximately 9.3 to 9.5 mils through said cardstock.

29. The assembly of claim 22 wherein said business card blanks comprise 2 x 3-1/2 inch business card blanks, and said sheet is 8-1/2 x 11 inches.

30. An assembly for passing through a printer or copier and then separating out into at least one printed media, comprising:

print media;

at least one substantial-cut line extending substantially the thickness of said print media; and

at least one weakened separation line on said print media;

wherein said separation line and said substantial-cut line together define at least a substantial portion of a perimeter of at least one printable media; and

wherein said print media is adapted to be passed through a printer or copier and desired indicia printed on said printable media, which can then be easily and cleanly separated from the rest of said print media along said separation line and said substantial-cut line to form individual printed media.

-17-

31. The assembly of claim 30 wherein said print media is a sheet, a roll or a fan fold.

32. The assembly of claim 30 wherein said print media is a sheet of paper.

33. The assembly of claim 32 wherein said at least one weakened separation line is formed by scoring said sheet from opposing sides.

34. The assembly of claim 32 wherein said sheet, before being passed through the printer or copier, is subjected to a process to make it more brittle.

35. The assembly of claim 34 wherein the process is a supercalendering process.

36. The assembly of claim 32 wherein said sheet, before being passed through the printer or copier, is subjected to a process to densify it.

37. The assembly of claim 36 wherein the densification process is a supercalendering process.

38. The assembly of claim 30 wherein said print media comprises a sheet.

- 18 -

39. The assembly of claim 38 wherein said individual printed media comprise a printed rectangular business card.

40. The assembly of claim 38 wherein said separation line comprises an elongate through-cut line cut all of the way through said sheet.

41. The assembly of claim 38 wherein said at least one substantial-cut line comprises two parallel substantial-cut lines and said at least one separation line comprises two parallel through-cut lines.

42. The assembly of claim 41 wherein said through-cut lines extend perpendicular to, between and engaging at opposite ends thereof said substantial-cut lines.

43. The assembly of claim 42 wherein said printable media comprise a rectangular business card blank.

44. The assembly of claim 38 wherein said substantial-cut line extends between 70 and 98 percent of the thickness of said sheet.

45. A method of producing printed media, comprising the steps of:

providing a printed sheet divided into a plurality of sheet portions, the sheet portions each having at least one edge thereof being defined by an

- 19 -

elongate substantial-cut line cut substantially but not all of the way through the sheet;

passing the sheet through a printer and thereby printing desired indicia on each of the sheet portions; and

after said printing step, separating the sheet portions, including separating along the elongate substantial-cut line, from the remainder of the sheet and from each other to form a plurality of individual printed media.

46. The method of claim 45 further comprising before said separating, applying a process to the sheet to make it more brittle.

47. The method of claim 46 wherein the process is a supercalendering process.

48. The method of claim 45 further comprising forming the substantial cut-line by scoring the sheet from both sides.

49. The method of claim 45 wherein the sheet portions are rectangular.

50. The method of claim 45 wherein the printed media comprise printed business cards.

- 20 -

51. The method of claim 45 wherein the substantial-cut line extends more than approximately 90 percent the way through the sheet.

52. The method of claim 45 wherein the substantial-cut line defines a first substantial-cut line, and the sheet portions each have at least another edge thereof being defined by a second elongate substantial-cut line cut substantially but not all of the way through the sheet, and said separating step includes separating along the second substantial-cut line.

53. The method of claim 52 wherein the substantial-cut line is cut between approximately 93 and 95 percent the way through the sheet.

54. The method of claim 52 wherein the substantial-cut line is cut between approximately 70 and 98 percent the way through the sheet.

55. The method of claim 52 wherein the substantial-cut line extends down from a top face of the sheet substantially through the sheet towards a bottom face thereof.

56. The method of claim 52 wherein the substantial-cut line is along an end of each of the sheet portions.

- 21 -

57. The method of claim 52 wherein the substantial-cut line is along both ends of each of the sheet portions.

58. The method of claim 57 wherein top and bottom edges of the sheet portions are defined by through-cut lines.

59. The method of claim 58 wherein each of the through-cut lines extends from one edge of the sheet portion to the other edge.

60. The method of claim 58 wherein the substantial-cut lines are formed in a trimming wheel, die cutting, laser scoring or chemical or acid etching process.

61. The method of claim 52 wherein the substantial-cut line is formed by trimming wheels, die cutting, laser or chemical or acid etching.

62. The method of claim 52 wherein the sheet portions are formed as two columns on the sheet with a waste strip between them, and the substantial-cut lines separate at least some of the sheet portions from the waste strip.

63. The method of claim 62 wherein the sheet portions are formed as at least one column on the sheet with side-margin waste strips, and the substantial-cut

- 22 -

lines directly abut and separate at least some of the sheet portions from the waste strip.

64. The method of claim 52 wherein the sheet portions are formed as at least one column of sheet portions on the sheet with side-margin waste strips, and the substantial-cut lines directly abut and separate at least some of the sheet portions from the waste strips.

65. The method of claim 52 wherein the sheet comprises approximately 8-12 mil thick media sheets.

66. The method of claim 52 wherein the sheet is about 8-12 mils thick cardstock.

67. The method of claim 52 wherein the portions are formed in at least one column on the page, and adjacent sheet portions abut one another, sharing a common-dividing line.

68. The method of claim 67 wherein the common dividing line is a through-cut line extending the full length of the portion.

69. The method of claim 52 wherein the through-cut lines are formed in a die cut process.



-23-

70. The method of claim 52 wherein the substantial-cut lines extend the entire length of the sheet engaging both end edges thereof.

71. The method of claim 52 wherein the substantial-cut lines extend between 70 and 98 percent of the thickness of the sheet.

72. The method of claim 52 wherein each of the sheet portions is rectangular and has a width of approximately two inches and a length of approximately 3-1/2 inches.

73. The method of claim 52 wherein the substantial-cut lines extend the full length of the sheet portions.

74. The method of claim 52 wherein the printer or copier is a laser printer.

75. The method of claim 52 wherein the printer or copier is an ink jet printer.

76. The method of claim 52 wherein the substantial-cut lines engage a front surface of the sheet and extend towards a back surface thereof approximately ninety percent of the thickness of the sheet.

77. A method of forming a sheet of easily and cleanly separable printable media, comprising the steps of:

- 24 -

providing a sheet of paper; and  
defining on the sheet a plurality of paper  
portions each shaped and dimensioned as separate media;

said defining including cutting substantially  
but not entirely through the sheet to form an elongate  
substantial-cut line defining a part of a perimeter of the  
portion, such that after the sheet has been passed through  
a printer or copier and indicia thereby printed on the  
portions, the portions can each be easily and cleanly  
separated along the substantial-cut line and the rest of  
the perimeters to form individual print media.

78. The method of claim 77 further comprising,  
before the sheet is passed through the printer or copier,  
subjecting the sheet to a process which makes it more  
brittle.

79. The method of claim 78 wherein the process is a  
supercalendering process.

80. The method of claim 77 wherein said substantial  
cutting step includes scoring the sheet on opposing sides.

81. The method of claim 77 wherein said defining  
includes the sheet portions being aligned in at least one  
column on the sheet.

82. The method of claim 77 wherein the substantial-  
cut line extends an entire side of the portion.

83. The method of claim 82 wherein the entire side is an end of the portion.

84. The method of claim 77 wherein the sheet portions are aligned in a column with long sides thereof directly abutting each other, their ends in straight alignment, and the substantial-cut line extending a length of the column and defining the ends.

85. The method of claim 77 wherein said defining step includes forming at least one elongate through-cut line extending all the way through the sheet to form at least another substantial part of a perimeter of the portion.

86. The method of claim 85 wherein the at least another substantial part includes the entire opposite lengths of the portion.

87. The method of claim 85 wherein said substantial-cut line forming is by a trimming wheel, die cutting, laser scoring or chemical or acid etching process.

88. The method of claim 77 wherein the sheet is card stock and the media are individual printed business cards.

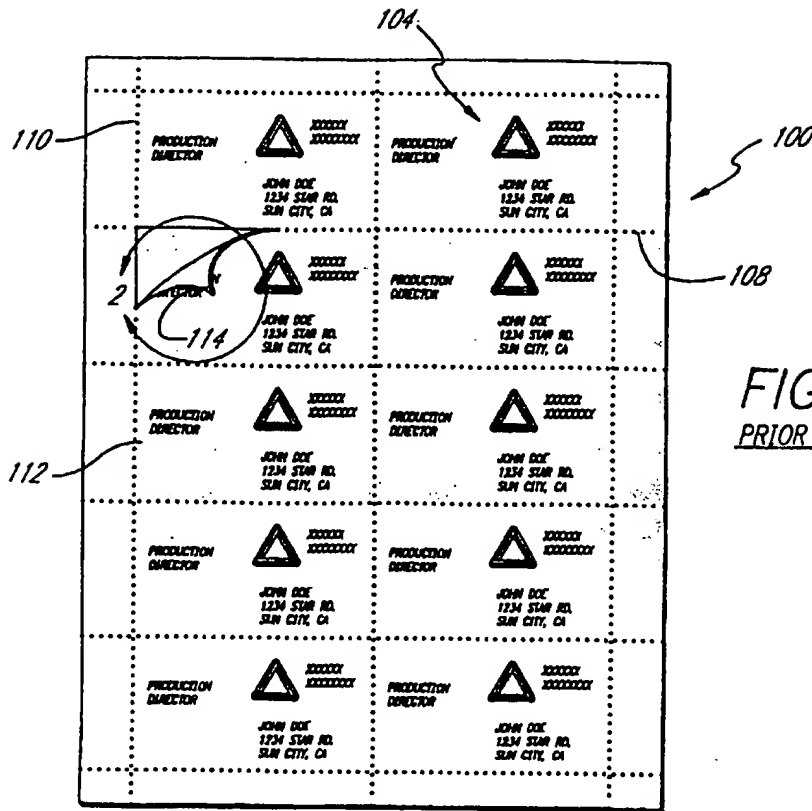


FIG. 1  
PRIOR ART

FIG. 2  
PRIOR ART

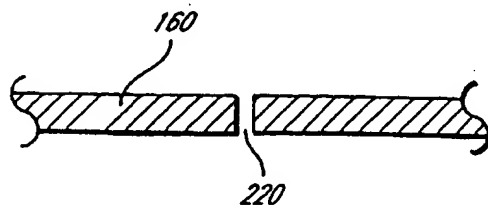
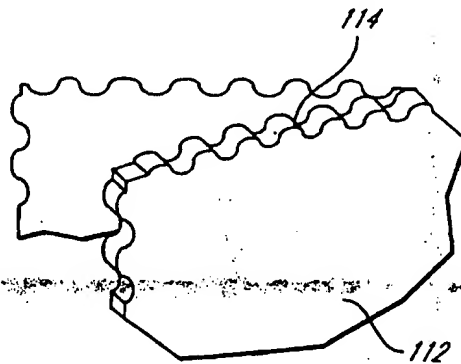
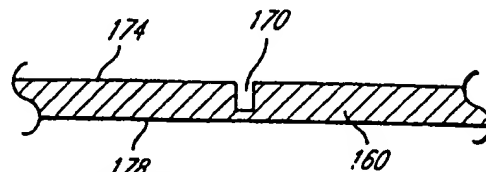


FIG. 5

FIG. 6



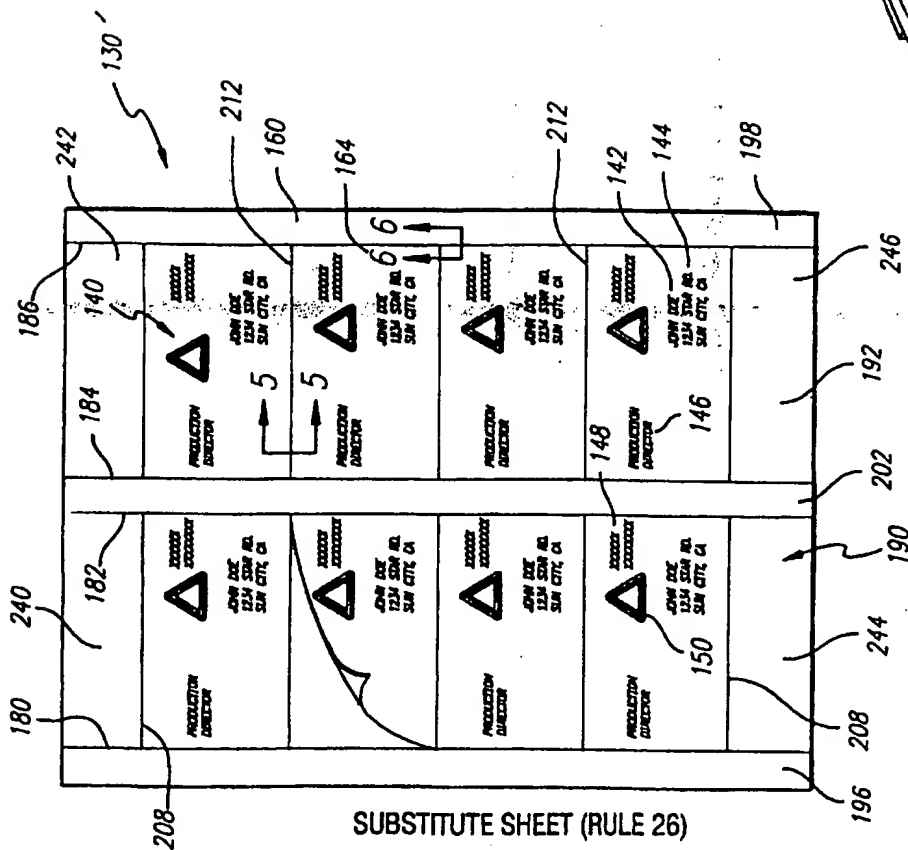


FIG. 4

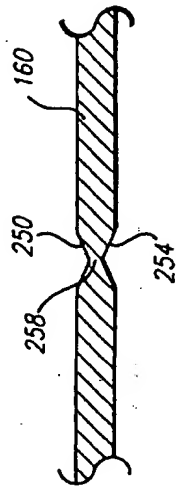


FIG. 7

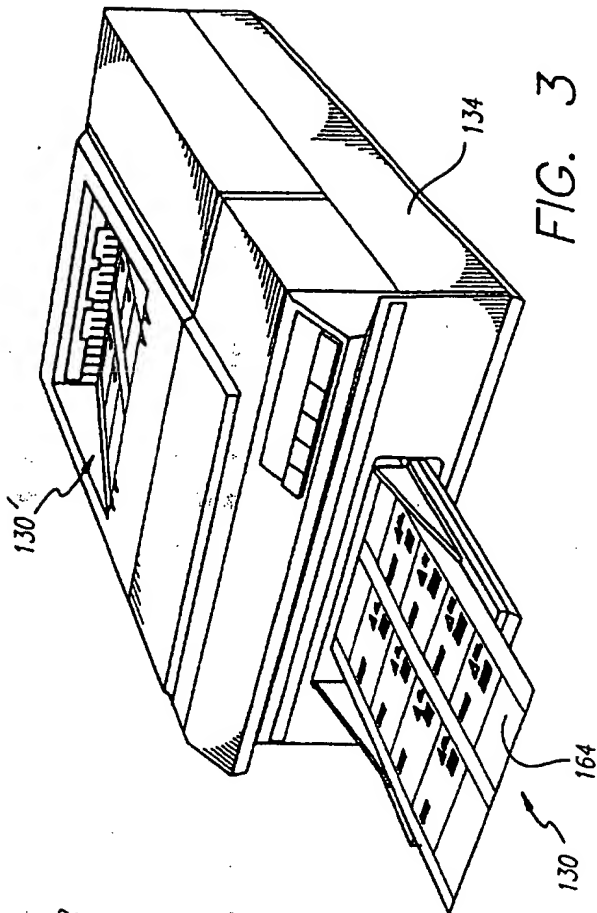


FIG. 3

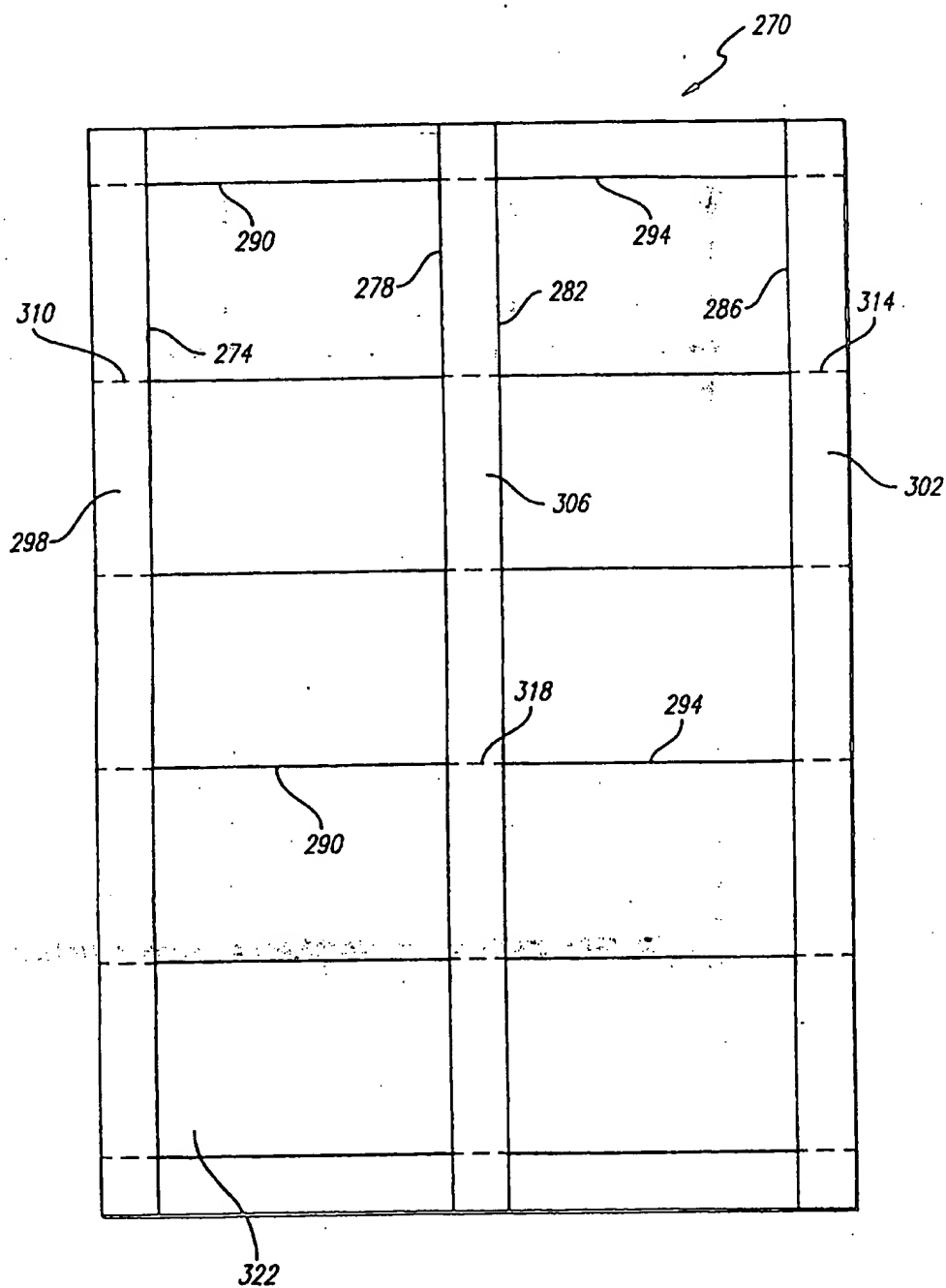


FIG. 8

SUBSTITUTE SHEET (RULE 26)

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US97/07321

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : B32B 3/00, 3/02, 3/10, 23/02; B42D 15/00; B65D 65/28

US CL : 428/43, 77, 78, 79, 81, 131, 138, 192; 283/105

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 428/43, 77, 78, 79, 81, 131, 138, 192; 283/105

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	US 5,571,587 A (BISHOP ET AL.) 05 November 1996, see whole document, especially col.2, lines 56-68.	1-88
A	US 5,238,269 A (LEVINE) 24 August 1993	1-88

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*A* document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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*R* document referring to an oral disclosure, use, exhibition or other means	
*I* document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search  
04 AUGUST 1997

Date of mailing of the international search report  
04 SEP 1997

Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C., 20231

Authorized officer:

WILLIAM KRYNSKI

Facsimile No. (703) 305-3230

Telephone No. (703) 308-0651